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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/585,263	05/17/2007	Li Jiang	57.0566 US PCT	2399

37003 7590 04/14/2010

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EXAMINER	
DIETERLE, JENNIFER M	
ART UNIT	PAPER NUMBER
1795	

MAIL DATE	DELIVERY MODE
04/14/2010	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/585,263	JIANG ET AL.	
	Examiner	Art Unit	
	Jennifer Dieterle	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 January 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-15* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *1/25/10, 1/28/10*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Status of Claims

Two claims, both labeled "14" were added by amendment (see claim objection below). Claims 1-13 and both claims labeled "14" are pending and are being examined.

Response to Amendment

Applicant's amendment of 1/28/10 does not render the application allowable.

Status of the Rejections

1. The rejection from the previous office action concerning Casimari et al. is maintained. New grounds of rejections under 35 U.S.C. 102(b) and 35 U.S.C. 103(a) are necessitated by amendments. Buck et al. (US 2002/0090632 A1) is being cited and relied on for the first time in this office action. Its use was necessitated by the amendment to the claims.

Comments

2. The objection to the claim 8 has been overcome by Applicant's amendment thereof.

3. The rejection of claim 1, under 35 U.S.C. 112, second paragraph, has been overcome by applicant's amendment noting that sections 0049, 50, 53 and 54, define redox systems which are a chemical systems in which oxidation and reduction reactions

occurs utilizing a molecule such as anthraquinone (AQC) or N,N'-diphenyl-p-phenylenediamine (DPPD), but could include any molecule that can easily be oxidized or reduced as noted in sections 0049, 50, 53 and 54.

Claim Objections

4. The numbering of claims is not in accordance with 37 CFR 1.126 which requires the original numbering of the claims to be preserved throughout the prosecution. When claims are canceled, the remaining claims must not be renumbered. When new claims are presented, they must be numbered consecutively beginning with the number next following the highest numbered claims previously presented (whether entered or not).

The amended claims introduce two claims both numbered as 14. For the purpose of rejection the first presented claim 14 will be referred to as 14a and the second presented claim 14 will be referred to as 14b.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. New added claim 14b (see claim objection above) is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 14b recites that **one** of the first or second redox systems are sensitive to H+; however, independent claim 1 recites that both redox systems are sensitive to the same species.

Therefore, claim 14b should recite that **both** the first and second redox system are sensitive to H+, since claim 1 requires that both the first and second are sensitive to the same species.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Casimari et al. (Biosensors & Bioelectronics, 1995, Vol. 11, No. 8, pages 783-789).

Regarding claim 1, Casimari et al. teach an electrochemical sensor comprising at least two redox active molecule (i.e. L-lactate oxidase (LOD) with L-lactate dehydrogenase (LDH); see abstract). Both are redox active molecules and both are covalently bonded to a polymer film and placed in *contact with* an electrode. The combination of the film and electrode function to sense L-lactate (pages 783-785).

7. Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Buck et al. (US 2002/0090632 A1).

Regarding claim 1, Buck et al. teach an electrochemical sensor comprising at least two redox active molecule in which osmium complex conjugates can be used in combination with another conjugated redox-reversible-species for the measurement of both glycosylated hemoglobin and hemoglobin (i.e. sensitive to same species) (paragraphs [0015, 0215-0219]). Buck et al. teach that conjugates can be used in any electrode structure/system which allows for diffusional recycling to achieve steady state current in response to application of pre-selected complex species-specific anodic and cathodic potentials (paragraph [0010]).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. Claims 1, 2, 4-6, 9, 10 and 14b are rejected under 35 U.S.C. 103(a) as being unpatentable over Wrighton et al. (US 5,223,117) in view of either Buck et al. (US 2002/0090632 A1) **or** Casimari et al. (Biosensors & Bioelectronics, 1995, Vol. 11, No. 8, pages 783-789).

Regarding claims 1 and 10, Wrighton et al. teach an electrochemical sensor comprising:

- A first and a second redox active molecule coupled to an electrode (figure 1; 16&18; col. 3, lines 1-4; figure shows 2 molecules). One molecule is specific for pH, the other molecule is specific for CO.

Wrighton et al. does not specifically teach the use of two separate redox molecules that are each sensitive to the same species.

Buck et al. teach an electrochemical sensor which utilizes two redox molecules that are sensitive to the same species in order to improve accuracy and to minimize

pertubations due to variability in the sample or electrode structure (paragraphs [0007-0008]),

Casimari et al. also teach an electrochemical sensor which utilizes two redox molecules sensitive to the same species (i.e. L-lactate). The two enzymes are coupled with a conductive substrate and configured to function as a working electrode (pages 783-785). Casimari et al. teach that the use of two enzymes sensitive to the same species provided better linearity with regard to the species of interest.

Therefore, it would have been obvious to one skilled in the art to modify the redox molecules of Wrighton et al. to utilize two redox molecules sensitive to the same species as taught by either Casimari et al. or Buck et al. because as shown by Casimari et al., through the use of two enzymes, linearity is improved and as shown by Buck et al., improved accuracy is achieved.

The additional limitations of claim 10 require a voltage supply, electric current or analyzer. Wrighton et al. teach all of these as follows:

- A voltage supply and electric current detector (abstract, since the device is a voltammetric microsensor it is inherent there be a voltage supple and since a measuring potential is determined a detector is inherent). Additionally, see votammogram figures 4a-d which would not be possible without a voltage supplying a current and a detector to produce the graph; and

- An analyzer. See figure 5 showing the use of derivatives to establish the differences in the peak positions which is done electronically, i.e. inherent analyzer (col. 8, lines 45-53).

Regarding claims 2 and 14b, Wrighton et al. teach a sensor capable of measuring pH (col. 2, line 9). Since a proton is a hydrogen ion (H+) and a pH sensor has a redox active compound that is sensitive to the concentration of protons (i.e. H+). By definition pH is the negative logarithm of H+ concentration to the base 10. Therefore, since the sensor of claim 1 is a pH meter the species are protons.

Regarding claim 4, Wrighton et al. teach that the at least two redox molecules are mounted onto the same conductive substrate (i.e. a AU substrate 12 that carries molecules M and R; figure 1a; col. 3, lines 1-18; NOTE: Applicants' in their specification paragraph [0045] acknowledge this prior art teaching).

Regarding claims 5 and 6, Wrighton et al. teach the use of carbon as an electrode (col. 4).

Regarding claim 9, Wrighton et al. provide graphs which would require a detecting device in order to be compiled.

9. Claims 3 and 14a are rejected under 35 U.S.C. 103(a) as being unpatentable over Wrighton et al. (US 5,223,117) and either Buck et al. **or** Casimari et al., as applied to claim 1 above, in further view of Wildgoose et al. (Talanta, 60, 2003, pages 887-893) Pandurangappa et al. (Analyst, 2003, 128, 473-479).

Regarding claims 3 and 14a, claim 3 incorporates all the limitations noted above for claim 1. Wrighton et al. does not specifically teach that two similar redox molecules will have maximum or peak redox reaction at different voltages.

Wildgoose et al. teach a pH sensor in which **anthraquinone species** (i.e. redox molecule) is derivatized with carbon powder and screen-printed on a BPPG electrode (page 887 - Introduction; page 888, col. 2, section 2.3, 1st paragraph) to produce a cheap and simple to use pH sensor (page 892, Conclusion). Additionally, Wildgoose et al. teach a reagentless sensor which offers better stability and less recalibration than historic (glass electrode, membrane) pH devices (page 887, Introduction). Wildgoose et al. teach that the use of anthraquinone provides for good linearity from pH 1 to 9 (page 890).

Pandurangappa et al. teach the same BPPG electrode onto which N,N'-diphenyl-p-phenylenediamine (DPPD) (i.e. redox molecule) is derivatized (page 473, col. 2). While the article specifically speaks to the use of this electrode for the detection of sulfide, it is clear from the chemical formula of DPPD on page 475 that it is capable of redox reaction through the gain/loss of hydrogen ions (i.e. be used to detect pH).

Pandurangappa et al. also teach that DPPD has a well resolved oxidation wave at 1 (page 477).

Therefore, it would be obvious to try placing anthraquinone and DPPD onto the electrode of Wrighton et al. as taught by Pandurangappa et al. and Wildgoose et al. because both molecules have maximum and minimum peak redox reaction at different voltages and Wildgoose et al. show that anthraquinone provides for good linear resolution from a pH of 1 to 9 and Pandurangappa et al. shows good resolution at pH 1 and lower; therefore, it would have been obvious to one skilled din the art to utilize anthraquinone and DPPD as the redox molecules since they will cover and provide good linearity for an entire range of pH.

10. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wrighton et al. (US 5,223,117) and either Buck et al. (US 2002/0090632 A1) **or** Casimari et al. (Biosensors & Bioelectronics, 1995, Vol. 11, No. 8, pages 783-789), as applied to claim 1 above, in further view of Kuo et al. (Electrochemical and Solid-State Letters, 2 (6), 1999, 288-290).

Regarding claim 7, Wrighton et al. teach an electrochemical sensor, but does not teach the use of diamond-based substrate.

Kuo et al. teach a diamond-based substrate for use in electrochemical applications requiring low background current, side potential window and excellent stability and facile electron transfer to redox systems (page 288, col. 1, first paragraph).

Therefore, it would have been obvious to one skilled in the art to modify the carbon power electrode of Wrighton et al. to be a carbon nanotube as taught by Kuo et al. because diamond-based substrates are stable and provide facile electron transfer in order to facility redox activity (i.e. pH) (page 288, col. 1, first paragraph).

11. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wrighton et al. (US 5,223,117) and either Buck et al. (US 2002/0090632 A1) **or** Casimari et al. (Biosensors & Bioelectronics, 1995, Vol. 11, No. 8, pages 783-789), as applied to claim 1 above, in further view of Wang et al. (Analyst, 2003, 129, 1-2).

Regarding claim 8, Wrighton et al. teach an electrochemical sensor, but does not teach the use of carbon nanotubes.

Wang et al. teach an electrochemical sensor in which carbon nanotubes are utilized and have a well defined appearance, are mechanically stable, and exhibit high electrochemical reactivity (page 1, col. 1, 1st paragraph).

Therefore, it would have been obvious to one skilled in the art to modify the carbon power electrode of Wrighton et al. to be a carbon nanotube as taught by Wang et al. because carbon nanotubes have well defined appearance, are mechanically stable, and exhibit high electrochemical reactivity (page 1, col. 1, 1st paragraph).

12. Claims 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wrighton et al. (US 5,223,117) and either Buck et al. (US 2002/0090632 A1) **or** Casimari et al. (Biosensors & Bioelectronics, 1995, Vol. 11, No. 8, pages 783-789), as applied to claim 1 above, in further view of Diakonov et al. (US 2003/0206026 A1).

Regarding claim 11-13, Wrighton et al. teach a tool for measuring effluents as stated in claim 1 above, but does not teach the use of the device as a downhole tool.

Diakonov et al. teach a sensor for wellbore applications (paragraph [0002]). Diakonov et al. teach that it is known in the art to have sensors permanently or quasi-permanently installed in a wellbore (paragraph [0003]) as part of a control system for wellbores in order to understand water chemistry to save costs and increase production during exploration (paragraph [0005]). Diakonov et al. teach that some parameters of species in well environment change significantly while on a trip to the surface and that pH, and CO2 are among the most critical parameters for corrosion and scale assessment so it is important to know their downhole values precisely (paragraph [0011]).

Therefore, it would have been obvious to one skilled in the art to modify the device of Wrighton et al. to be used in a well environment, either permanently or quasi-permanently installed, as a downhole sensor as taught by Diakonov et al. because knowing the pH and other parameters help to detect corrosion and scale assessment (Diakonov et al. paragraph [0011]) and help to save costs and increase production (paragraph [0005]).

A recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. (See *In re Casey*, 152 USPQ 235 (CCPA 1967) and *In re Otto*, 136 USPQ 458,459 (CCPA 1963); MPEP 2111.02).

Response to Arguments

Applicant's arguments with respect to claims 1-13 have been considered but are moot in view of the new ground(s) of rejection.

13. Regarding applicant's remarks concerning that Casimari et al. does not teach coupling two redox systems with a conductive substrate for functioning in use as a working electrode are not persuasive. As claim 1 is currently written (amended) the language of claim 1 broadly read only requires two redox systems sensitive to the same species and that these molecules are *coupled with* a conductive substrate. In Casimari, there are two redox molecules covalently bonded to a polymer that is *coupled with* a cathode. Without the polymer film and the cathode working in conjunction (i.e. coupled with) L-lactate will not be detected. Additionally, applicant's argue that the two enzymes of Casimari et al. are not intended to and do not undergo a redox reaction with the same species. However, all that the claim requires is that there are two redox systems sensitive to the same species which Casimari discloses as LDH and LOD. The claim is

a device claim and is not drawn as to how the molecules function with each other or as to how they function with the species of interest.

14. Regarding applicant's remarks concerning Wrighton et al., Wrighton has been modified above due to applicant's amendments.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer Dieterle whose telephone number is (571) 270-7872. The examiner can normally be reached on Monday thru Friday, 8am to 5pm (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Nam X Nguyen/
Supervisory Patent Examiner, Art Unit 1753

JMD
4/2/10